We Claim:

1. A process for making a catalyst comprising:

altering the precipitation of a catalyst component from a catalyst synthesis solution by controlling the viscosity of a catalyst synthesis solution with the addition of aluminum alkyls, wherein the average particle size of the catalyst component increases with an increased concentration of aluminum alkyl in the synthesis solution.

2. The process of claim 1 further comprising contacting the catalyst component with an organometallic preactivating agent to form a catalyst, wherein the average particle size of the catalyst increases with an increased concentration of aluminum alkyl in the synthesis solution.

3. The process of claim 1 wherein the catalyst synthesis solution comprises:

contacting a magnesium dialkoxide compound with a halogenating agent to form a reaction product A; and

contacting reaction product A with a series of halogenating/titanating agents to form a catalyst component; and

contacting the catalyst component with an organometallic preactivating agent to form a catalyst;

wherein the average particle size of the catalyst increases with an increased concentration of aluminum alkyl in the synthesis solution.

4. The process of claim 3 wherein at least one of reaction product A and the resulting reaction products after each halogenating/titanating step are washed with a solvent to remove contaminants.

6. A process for making a catalyst comprising:

a) contacting a magnesium dialkoxide compound with a halogenating agent to form a reaction product A;

b) contacting reaction product A with a first halogenating/titanating agent to form reaction product B;

c) contacting reaction product B with a second halogenating/titanating agent to form reaction product C; and

d) contacting reaction product C with a third halogenating/titanating agent to form reaction product D; and

e) contacting reaction product D with an organometallic preactivating agent to form a catalyst;

wherein the magnesium dialkoxide compound is a reaction product of a reaction comprising a magnesium alkyl compound of the general formula MgRR', wherein R and R' are alkyl groups of 1-10 carbon atoms and may be the same or different, an alcohol of the general formula R"OH wherein the alcohol is linear or branched and wherein R" is an alkyl group of 2-20 carbon atoms, and an aluminum alkyl of the formula AlR'''_3 wherein at least one R''' is an alkyl or alkoxide having 1-8 carbon atoms or a halide, and wherein each R''' may be the same or different; and

wherein the average particle size of the catalyst increases with an increased aluminum alkyl to magnesium alkyl ratio.

7. The process of claim 6 wherein the ratio of aluminum alkyl to magnesium alkyl is in the range of about 0.01:1 to about 10:1.

8. The process of claim 6 wherein steps c) and d) each comprise titanium tetrachloride as the halogenating/titanating and the titanium tetrachloride to magnesium ratio in the range of about 0.1 to about 5.

9. The process of claim 6 wherein the magnesium dialkoxide compound is a magnesium di(2-ethylhexoxide).

10. The process of claim 6 wherein the alkyl magnesium compound is diethyl magnesium, dipropyl magnesium, dibutyl magnesium or butylethylmagnesium.

11. The process of claim 6 wherein the alcohol is selected from the group consisting of ethanol, propanol, isopropanol, butanol, isobutanol, 2-methyl-pentanol, and 2-ethylhexanol.

12. The process of claim 6 wherein the organometallic preactivating agent comprises an aluminum alkyl.

13. The process of claim 6 wherein the first halogentating/titanating agent is a blend of two tetra-substituted titanium compounds with all four substituents being the same and the substituents being a halide or an alkoxide or phenoxide with 2 to 10 carbon atoms.

14. The process of claim 13 wherein the first halogentating /titanating agent is a blend of a titanium halide and an organic titanate.

15. The process of claim 14 wherein the first halogentating/titanating agent is a blend of $TiCl_4$ and $Ti(OBu)_4$ in a range from 0.5:1 to 6:1 $TiCl_4/Ti(OBu)_4$.

16. The process of claim 6 wherein the reaction further comprises an electron donor.

17. The process of claim 16 wherein the ratio of electron donor to magnesium is in the range of about 0:1 to about 10:1.

18. The process of claim 16 wherein the electron donor is an ether.

19. The process of claim 6 wherein the halogenating agent is of the general formula $ClAR'''_x$, wherein A is a nonreducing oxyphilic compound, R''' is a hydrocarbyl moiety having from about 2 to 6 carbon atoms, and x is the valence of A minus 1.

20. The process of claim 19 wherein the halogenating agent is $ClTi(O^iPr)_3$.

21. The process of claim 6 wherein at least one of the reaction products A, B, C and D are washed with a hydrocarbon solvent until titanium species [Ti] content is less than about 100 mmol/L.

22. The process of claim 6 wherein an electron donor is present in any one or more of steps a), b), c), or d), and wherein the ratio of electron donor to metal is in the range of about 0:1 to about 10:1.

23. The process of claim 6 further comprising placing the catalyst of the invention on an inert support.

24. The process of claim 23 wherein the inert support is a magnesium compound.

25. A catalyst produced by a process comprising:

a) contacting a catalyst component with an organometallic preactivating agent, wherein the catalyst component is produced by a process comprising,

i) contacting a magnesium dialkoxide compound of the general formula $Mg(OR'')_2$ with a halogenating agent capable of exchanging one halogen for one alkoxide to form a reaction product A, where R" is a hydrocarbyl or substituted hydrocarbyl having from 1 to 20 carbon atoms;

ii) contacting reaction product A with a first halogenating/titanating agent to form reaction product B;

iii) contacting reaction product B with a second halogenating/titanating agent to form reaction product C; and

iv) contacting reaction product C with a third halogenating/titanating agent to form a catalyst component;

wherein the magnesium dialkoxide compound is a reaction product of a reaction comprising a magnesium alkyl compound of the general formula MgRR', wherein R and R' are alkyl groups of 1-10 carbon atoms and may be the same or different, an alcohol of the general formula R"OH wherein the alcohol is linear or branched and wherein R" is an alkyl

group of 2-20 carbon atoms, and an aluminum alkyl of the formula AlR'''_3 wherein at least one R''' is an alkyl or alkoxide having 1-8 carbon atoms or a halide, and wherein each R''' may be the same or different; and

wherein the average particle size of the catalyst increases with an increased aluminum alkyl to magnesium alkyl ratio.

26. The catalyst of claim 25 wherein the organometallic preactivating agent is an aluminum alkyl of the formula AlR_3 wherein at least one R is an alkyl having 1-8 carbon atoms or a halide, and wherein each R may be the same or different.

27. The catalyst of claim 26 wherein the organometallic preactivating agent is a trialkyl aluminum.

28. The catalyst of claim 25 wherein the second and third halogenating/titanating agents comprise titanium tetrachloride.

29. The catalyst of claim 25 wherein the ratio of aluminum to titanium is in the range from 0.1:1 to 2:1.

30. A polymer produced by a process comprising:

a) contacting one or more olefin monomers together in the presence of a catalyst under polymerization conditions, wherein the catalyst is produced by a process comprising:

i) contacting a magnesium alkyl compound of the general formula MgRR', wherein R and R' are alkyl groups of 1-10 carbon atoms and may be the same or different, with an alcohol of the general formula R"OH wherein the alcohol is linear or branched and wherein R" is an alkyl group of 2-20 carbon atoms, and an aluminum alkyl of the formula AlR'''_3 wherein at least one R''' is an alkyl or alkoxide having 1-8 carbon atoms or a halide, and wherein each R''' may be the same or different, to form a magnesium dialkoxide of the general formula $Mg(OR")_2$;

ii) contacting the magnesium dialkoxide compound with a halogenating

agent to form a reaction product A, where R" is a hydrocarbyl or substituted hydrocarbyl having from 1 to 20 carbon atoms;

iii) contacting reaction product A with a first halogenating/titanating agent to form reaction product B; and

iv) contacting reaction product B with a second halogenating/titanating agent to form reaction product C; and

iv) contacting reaction product C with a third halogenating/titanating agent to form a catalyst component; and

v) contacting the catalyst component with an organoaluminum agent; and

b) extracting polyolefin polymer;

wherein the average particle size of the polymer increases with an increased aluminum alkyl to magnesium alkyl ratio utilized in step i).

31. The polymer of claim 30 wherein at least one of the reaction products A, B, and C are washed with a hydrocarbon solvent prior to subsequent halogenating/titanating steps.

32. The polymer of claim 30 wherein the monomers are ethylene monomers.

33. The polymer of claim 30 wherein the polymer is polyethylene.

34. The polymer of claim 30 wherein the polymer has a molecular weight distribution of at least 4.0.

35. The polymer of claim 30 wherein the polymer has a bulk density of at least 0.31 g/cc.

36. Film, fiber. pipe, textile material, or an article of manufacture comprising the polymer of claim 30.

37. A process for controlling polyolefin polymer particle size comprising:

a) contacting one or more olefin monomers together in the presence of a catalyst

under polymerization conditions,

wherein the catalyst is produced by a process comprising:

i) contacting a magnesium alkyl compound of the general formula MgRR', wherein R and R' are alkyl groups of 1-10 carbon atoms and may be the same or different, with an alcohol of the general formula R"OH wherein the alcohol is linear or branched and wherein R" is an alkyl group of 2-20 carbon atoms, and an aluminum alkyl of the formula AlR'''_3 wherein at least one R''' is an alkyl or alkoxide having 1-8 carbon atoms or a halide, and wherein each R''' may be the same or different, to form a soluble magnesium dialkoxide of the general formula $Mg(OR")_2$;

ii) contacting the soluble magnesium dialkoxide compound with a halogenating agent capable of exchanging one halogen for one alkoxide to form a reaction product A, where R" is a hydrocarbyl or substituted hydrocarbyl having from 1 to 20 carbon atoms;

iii) contacting reaction product A with a first halogenating/titanating agent to form reaction product B; and

iv) contacting reaction product B with a second halogenating/titanating agent to form reaction product C; and

vi) contacting reaction product C with a third halogenating/titanating agent to form a catalyst component; and

vii) contacting the catalyst component with an organoaluminum agent; and

b) extracting polyolefin polymer;

wherein the average particle size of the polymer increases with an increased aluminum alkyl to magnesium alkyl ratio utilized in step i).